

Recent Enhancements to the CDDIS

Carey E. Noll
NASA GSFC

Introduction

The Crustal Dynamics Data Information System (CDDIS) has served as a global data center for the International GPS Service (IGS) since its start in June 1992, providing on-line access to data from over 160 sites on a daily basis. Operational and regional data centers deposit data to the CDDIS several times per day; data holdings are then equalized among all global data centers (i.e., IGN and SIO). During 1998, approximately 45 percent of all data were available to users within one hour of the end of the observation day; 65 percent were available within three hours and 75 percent were available within six hours.

Each GPS site produces approximately one Mbyte/site/day of GPS data in compressed format. The CDDIS continues to make GPS data available in both compressed (O file extension) and compressed compact RINEX (D file extension) formats. UNAVCO's TEQC software is utilized on all incoming data to validate format and data quality. Metadata are extracted from the GPS data and an online database inventory is maintained to monitor all data received. Daily status files (an example shown in the figure below) are generated with information extracted from the RINEX header, such as receiver and antenna type, antenna height, and hour delay in delivery.

IGS Tracking Network Status for 20-Oct-98 981020 98293 GPS Week 0980 Day 3 As of date: Oct 28 1998 13:33:09															
Site	Dly (H)	No. Exp.	No. Obs.	Pts. Del.	%	Avg. MP1	Avg. MP2	Pos. Diff	No. Slips	V	Receiver Type	Antenna Type	Ant. Height	Marker Name	Marker Number
albh	1	20009	19358	0	96	0.41	0.76	0.05	44	1	ROGUE SNR-8000	DORNE MARGOLIN T	0.100	albh	40129M003
alpo	1	20338	18924	13	93	0.38	1.02	0.03	15	1	ROGUE SNR-8000	DORNE MARGOLIN T	.100	alpo	40104M002
alic	6	22007	19262	0	87	1.23	1.91	0.11	755	1	ROGUE SNR-8100	DORNE MARGOLIN T	0.007	ALIC	
amc2	26	3375	3105	187	92	0.32	0.78	0.04	11	1	ROGUE SNR-12	DORNE MARGOLIN T	.000	AMC2	XXXXXXXX
amct															
amun	7	26139	26041	83	99	0.59	0.49	0.00	23	1	ASHTECH Z-XII3	DORNE MARGOLIN ASH	0.079	AMUN	
ankr															
aoa1	1	19835	17822	518	89	0.42	0.69	0.00	35	1	ROGUE SNR-8000	DORNE MARGOLIN T	0.000	AOA1	40483S001
aoam	2	20935	17765	932	84	0.36	0.76	0.06	41	1	ROGUE SNR-8000	DORNE MARGOLIN T	.000	ATLANTIC OCEANOGRAPH	49914S001
areq	8	21429	14592	3847	68	0.26	0.74	0.00	98	1	ROGUE SNR-8000	DORNE MARGOLIN T	0.061	AREQ	42202M005
asc1	2	23420	9394	7284	40	0.40	0.72	0.00	108	1	ROGUE SNR-8000	DORNE MARGOLIN T	0.067	ASC1	30602M001
auck	2	20108	18328	135	91	0.24	0.69	0.00	19	1	ROGUE SNR-8000	DORNE MARGOLIN T	0.001	AUCK	50209M001
azul	2	19858	16762	1014	84	0.44	0.77	0.00	39	1	ROGUE SNR-8000	DORNE MARGOLIN T	0.081	AZU1	49911M001
bahr	3	20933	18057	61	86	0.34	0.47	0.04	11	1	ASHTECH Z-12	DORNE MARGOLIN ASH	3.122	BAHR	249010M02
bako	163	25130	21371	339	85	0.51	0.60	0.08	113	1	TRIMBLE 4000SSE	4000ST L1/L2 GEOD	1.676	BAKO	TTG.1
barb															
barh	2	20179	19533	329	96	0.29	0.81	0.46	47	1	TRIMBLE SSI	Trimble chokering	0.000	barh	xxx
boqt	8	23590	12996	5240	55	0.42	0.89	0.00	117	1	ROGUE SNR-8000	DORNE MARGOLIN T	0.061	BOGT	41901M001
yarl	2	20012	18263	305	91	0.23	0.66	0.00	48	1	ROGUE SNR-8100	DORNE MARGOLIN T	0.081	YAR1	50107M004
ye11	1	22385	21554	1	96	0.48	0.76	0.03	2	1	ROGUE SNR-12 RM	DORNE MARGOLIN T	.100	ye11	40127M003
zeck	22	21606	20021	132	92	0.36	0.61	0.06	20	1	ROGUE SNR-8000	DORNE MARGOLIN T	0.045	ZECK	12351M001
zimm	6	20343	20089	50	96	0.30	0.67	0.07	19	1	TRIMBLE 4000SSE	4000ST L1/L2 GEOD	0.000	ZIMM	14001M004
zwen	47	22741	20400	0	89	0.51	0.88	0.06	79	1	ROGUE SNR-8000	DORNE MARGOLIN T	0.046	zwen	12330M001

Program: QC V3 by UNAVCO run with elevation angle cutoff of 10 degrees			
Field	Size	Type	Explanation
Site	4	char	Site name
Dly (H)	3	number	Delivery delay in hours
No. Exp.	5	number	Total number of observations expected
No. Obs.	5	number	Total number of observations in file
Pts. Del.	5	number	Total number of points deleted
%	3	number	Data collection percentage
Avg. MP1	4	number	Average L1 multipath (rounded to two decimal places)
Avg. MP2	4	number	Average L2 multipath (rounded to two decimal places)
Pos. Diff	4	number	RINEX vs QC point position difference (Km)
No. Slips	4	number	Number of detected slips
V	1	number	Version of the data file (set to 1 for initial delivery)
Receiver Type	20	char	Type of GPS receiver from RINEX header
Antenna Type	20	char	Type of GPS antenna from RINEX header
Ant. Height	6	number	Height of antenna from RINEX header
Marker Name	20	char	Marker name from RINEX header
Marker Number	10	char	Marker DOMES number from RINEX header

Figure. Daily Status File Produced by CDDIS

Computer System Enhancements

Procurement of a replacement hardware platform for the CDDIS VAX system was undertaken in early 1997. This new system is a DEC AlphaServer 4000 running the UNIX operating system; the host name for this computer is `cddisa.gsfc.nasa.gov`. The system is currently equipped over 120 Gbytes of on-line magnetic disk storage; nearly ninety additional Gbytes of storage is on order. All GPS data activities were transferred to the UNIX platform by mid-1998. GPS data and products are now accessible on this system through anonymous ftp and the WWW. Over one year of GPS data are online; all products since the start of the IGS Test Campaign (mid-1992) are also online.

An area of ongoing concern to the CDDIS staff has been the ability to respond to special requests for older, off-line GPS data. Currently, this is a time-consuming activity for the staff since all older data are stored on optical disks in VAX VMS file format and the CDDIS VAX system is equipped with only two optical disk drives. The CDDIS AlphaServer system under UNIX is not equipped with these magneto-optical drives; therefore, a new medium for long-term storage of the historic GPS archive has been identified: CD-ROM. A CD recordable system and 600 platter jukebox were purchased in 1997. The CD recordable system consists of a Macintosh computer and a CD-ROM tower with the capability of recording up to five copies of a CD. Migration of the existing GPS archive on magneto-optical disks (in VAX/VMS format) to CD-ROM has begun. The data are written to CD-ROM by GPS week. Thus far, the majority of 1997 data are now on CD-ROM and are accessible through the jukebox.

Changes in the Data Archive

The CDDIS data and product archive directories were consolidated to a single file system accessible via anonymous ftp once the new computer was operational in mid-1998. This change has simplified data access for the user community since all data are now under one directory path.

In mid-1998, the CDDIS began providing the IGS user community with access to hourly data files. Hourly data from over thirty sites are transmitted to CDDIS from JPL, ESA, and IGN. The hourly data are archived on CDDIS in a timely fashion (e.g., within minutes of receipt) and are retained for three days. After three days, the hourly data are deleted; the daily file, transmitted through normal channels with typically a one to two hour delay, will have been received and archived already and thus the hourly data are of little use.

A Call for Participation in the 1998 International GLONASS EXperiment (IGEX-98) was issued in early 1998. IGEX-98 is sponsored by several organizations, including the IGS, and requested participation by stations, data centers, and analysis centers. The CDDIS responded to this call and was accepted as a global data center. On-line directories, accessible via anonymous ftp, for GLONASS data and products were established; the CDDIS currently archives data from over fifty stations participating in IGEX-98.

Changes in the Product Archive

Starting in early 1998, the IGS Analysis Center Coordinator began generating predicted orbit, clock, and Earth rotation parameter combinations based upon the individual ACs'

predicted solutions. These solutions, designated IGP, are available within 0.5 hours of the beginning of the observation day. Also early in 1998, the IGS Analysis Center Coordinator began generating accumulated IGR and IGS ERP files on a daily and weekly basis; these data are used with either the final or the rapid orbits. These files are produced at the same time as the IGS rapid and final products are generated and downloaded by the IGS Global Data Centers.

The CDDIS began generating "short-SINEX" files, designated with an .SSC extension in early 1998. These files contain the site information from the SINEX file but no matrices. The files are stored in the weekly IGS product subdirectories.

Since January 1997, the IGS has conducted a pilot experiment on the combination of troposphere estimates. Using a sampling rate of two hours, the zenith path delay (ZPD) estimates generated by the IGS analysis centers were combined by GFZ to form weekly ZPD files for over 150 IGS sites. These troposphere products are available at the CDDIS starting in early 1998.

As of mid-1998, several IGS Analysis Centers began supplying daily, global ionosphere maps of total electron content (TEC) in the form of IONEX (an official format for the exchange of ionosphere maps) files. These products are also available at the CDDIS and are located in subdirectories of the main product area, rather than under the weekly subdirectory structure, since the files are produced daily.

Future Plans

The CDDIS staff plans to continue the migration of older GPS data to CD-ROM during 1999. One area under investigation is a common directory structure for data and products among all IGS data centers. This system would aid IGS analysis centers and users in navigation of multiple data centers. An extension of this plan is the participation of IGS data centers in the GPS Seamless Archive Center (GSAC) activity, sponsored by UNAVCO, and designed to allow easy navigation of multiple GPS archives for data of interest. Both activities will be investigated further to ascertain how best to implement the concepts within the CDDIS.

Contact Information

To obtain more information about the CDDIS, contact:

Ms. Carey E. Noll
Manager, CDDIS
Code 922
NASA/GSFC
Greenbelt, MD 20771

Phone: (301) 286-9283
FAX: (301) 286-0213
E-mail: noll@cddis.gsfc.nasa.gov
WWW: http://cddisa.gsfc.nasa.gov/cddis_welcome.html